Tangent lines

You'll see it written different ways, but in general the formula for the equation of the tangent line is

$$y = f(a) + f'(a)(x - a)$$

When a problem asks you to find the equation of the tangent line, you'll always be asked to evaluate at the point where the tangent line intersects the graph.

In order to find the equation of the tangent line, you'll need to plug that point into the original function, then substitute your answer for $f(a)$. Next you'll take the derivative of the function, plug the same point into the derivative and substitute your answer for $f'(a)$.

Example

Find the equation of the tangent line at $x = 4$.

$$f(x) = 6x^2 - 2x + 5$$

First, plug $x = 4$ into the original function.

$$f(4) = 6(4)^2 - 2(4) + 5$$

$$f(4) = 96 - 8 + 5$$

$$f(4) = 93$$

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Next, take the derivative and plug in $x = 4$.

$$f'(x) = 12x - 2$$

$$f'(4) = 12(4) - 2$$

$$f'(4) = 46$$

Finally, insert both $f(4)$ and $f'(4)$ into the tangent line formula, along with 4 for a, since this is the point at which we're asked to evaluate.

$$y = 93 + 46(x - 4)$$

You can either leave the equation in this form, or simplify it further:

$$y = 93 + 46x - 184$$

$$y = 46x - 91$$

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